

PATENT APPLICATION  
OF  
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FOR  
BEVERAGE FILTER CARTRIDGE

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

This invention relates generally to single serve beverage brewing systems, and is concerned in particular with an improved filter cartridge for use in such systems.

### 2. Description of the Prior Art

In a known beverage filter cartridge of the type disclosed in U.S. Patent Nos. 5,325,765 and 5,840,189, the cone-shaped filter element has a somewhat limited storage capacity for the beverage medium. Moreover, the configuration of the filter element encourages rapid liquid penetration to and through the lower end, resulting in less than optimum saturation of the beverage medium at upper regions of the filter element adjacent to the container wall. The combined effect of limited storage capacity and less than optimum saturation is a lowering of the total dissolved solids ("TDS") in the brewed beverage, which translated into reduced flavor.

In an attempt at increasing the TDS of the resulting brew, and as shown in copending commonly owned U.S. Patent Application Serial No. 09/782,622, beverage medium storage capacity was increased by lowering the level of attachment of the filter element to a reconfigured outer container wall. Although this did indeed increase the amount of beverage medium available for brewing, it did so at a cost of also increasing the amount of beverage medium receiving less than optimum saturation, with the net affect being an insignificant increase in TDS of the brewed beverage.

The present invention is directed to overcoming the drawbacks of the prior art by providing an improved combination of cartridge container and internal filter that achieves both increased storage capacity for the beverage medium, and optimized saturation, resulting in significantly increase TDS levels in the resulting brewed beverage.

### SUMMARY OF THE INVENTION

In accordance with the present invention, a beverage filter cartridge has an impermeable cup-shaped container with a bottom and a side wall diverging upwardly to a collar surrounding a top opening. A filter element has a substantially flat bottom and a side wall diverging upwardly to an upper rim. The said filter element is received in the container with its bottom spaced both inwardly from the container side wall and vertically from the container bottom, and with its upper rim joined at a peripheral juncture to the interior of the container side wall. The interior of the container is thus subdivided by the filter element into a first chamber accessible via the top container opening, and a second chamber disposed between the vertically spaced filter and container bottoms. The filter side wall has exterior channels that face the interior of the container side wall and that lead from the aforesaid peripheral juncture to the second chamber. A beverage medium is received in the first chamber via the container top opening, and an impermeable cover is sealed to the container collar. The cover is piercable to admit liquid into the first chamber for infusion with the beverage medium to produce a beverage, the filter element is permeable to accommodate a flow therethrough of the beverage for delivery via the exterior filter channels to the second chamber, and the container bottom is piercable to accommodate an outflow of the beverage from the cartridge. These and other features and advantages of the

present invention will now be described in greater detail with reference to the accompanying drawings, wherein:

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a vertical sectional view taken through a beverage filter cartridge in accordance with one embodiment of the present invention;

Figure 2 is an exploded perspective view of the components of the filter cartridge;

Figure 3 is a top plan view of the filter element;

Figure 4 is a sectional view taken along line 4-4 of Figure 1;

Figure 5 is a perspective view of an alternative embodiment of a filter element;

Figure 6 is a sectional view of the filter element shown in Figure 5;

Figure 7 is a top plan view of the filter element shown in Figure 5;

Figure 8 is a view similar to Figure 1 showing the outer container pierced by inlet and outlet probes during a brewing cycle; and

Figure 9 is another view similar to Figure 1 showing a double-walled filter element.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

With reference initially to Figures 1-4, a beverage filter cartridge in accordance with one embodiment of the present invention is shown at 10. The cartridge includes an impermeable cup-shaped container 12 having a first bottom wall 14 and a first side wall 16 diverging upwardly to a collar 18 having a peripheral lip 20 surrounding a top opening 22.

As herein employed, the term “impermeable” means substantially resistant to the passage therethrough of liquids and gases. The container 12 may be formed of any one of many commercially available materials, e.g., polystyrene, polyethylene, polypropylene, laminated composites thereof, etc. A filter element 24 has a substantially flat second bottom 26 and a second side wall 28 diverging upwardly to an upper rim 30. The filter element is permeable to liquids, and again may be formed from commercially available materials, e.g., paper or polymer materials. The filter element 24 is received in the container 12 with its bottom 26 spaced both inwardly from the container side wall 16 and vertically from the container bottom wall 14. The upper rim 30 of the filter is joined, as by heat sealing at a peripheral juncture 32, to the interior of the container side wall 16 in the vicinity of collar 18. When thus positioned, the filter element subdivides the interior of the container into a first chamber A accessible via the top opening 22 of the container, and a second chamber B disposed between the filter and container bottoms 26, 14.

The filter side wall 28 is configured to provide exterior channels indicated typically at 34 that face the interior of the container side wall 16 and that lead downwardly from the peripheral juncture 32 to the second chamber B. Preferably, the filter wall 28 is disposed at an angle of less than about  $1^\circ$  with respect to the container wall 16, with angles of between about  $0.5$  to  $0.9^\circ$  being preferable.

A beverage medium 36 is received in the first chamber A via the container top opening 22 and an impermeable cover 38 is joined as by heat sealing to the peripheral lip 20 of the container side wall 16.

The cover may be formed of a plastic, metallic foil, or any laminated composite thereof. In accordance with conventional practice, oxygen may be purged from the container interior by the introduction of an inert gas, e.g., nitrogen, prior to sealing the cover in place.

The height  $h_1$  of the first chamber A is between about 75 to 80% of the height  $h_2$  of the cartridge interior. This, combined with the substantially flat filter bottom 26, maximizes the storage capacity for the beverage medium 36.

As shown in Figure 8, during a brewing cycle, the cover 38 is pierced by a tubular inlet probe 40 to admit heated liquid into chamber A for infusion with the beverage medium to produce a liquid beverage. The permeability of the filter element 24 accommodates a flow therethrough of the beverage into the second chamber B. The channels 34 provide critical exit passageways for the beverage permeating through the filter side wall and in so doing encourage full saturation of the beverage medium in areas adjacent to the container side wall.

The container bottom 14 is pierced by a tubular outlet probe 42 to accommodate an outflow of the beverage from the cartridge. The vertical spacing of the filter bottom 26 from the container bottom 14 insures that the filter will be safeguarded from inadvertent puncture by the outlet probe 42.

The channels 34 may be provided by forming the filter side wall with a fluted configuration as shown in Figures 1-4. Alternatively, as shown for example in Figures 5-7, channels 34' may be formed by pleats 44 in the filter side wall. When thus formed, the channels increase in width from a minimum at the upper rim of the filter to a maximum at the filter bottom.

While the above described fluted and pleated configurations of the filter side wall are considered to be preferable, any other configuration of the filter side wall and/or the container side wall providing exit channels and the like leading to the second chamber B would be acceptable,

provided that they encourage through flow in upper regions of the filter wall.

Infusion of the beverage medium in the upper regions of the filter element may be further enhanced by decreasing the permeability of lower regions of the filter element. As shown in Figure 9, this can be accomplished, for example, by providing the filter element with a complimentary shaped insert 46 of the same or like filter material. This will retard permeation of the beverage in the lower filter regions in favor of enhanced permeation in the upper regions adjacent to the container side wall.

Although the preceding description has been directed to specific embodiments of the invention, it will now be apparent to those skilled in the art that variations and modifications can be made with the attachment of some or all of the advantages of the invention. It is the objective of the appended claims to cover all such variation and modifications as come within the true spirit and scope of the invention.

I claim: